NOAA's Role in Oil Spill Response

(Steve Lehmann, NOAA Scientific Support Coordinator)

Origins of NOAA HAZMAT Program…

– 1976

Argo Merchant oil spill, Nantucket, Massachusetts

The tanker broke into two pieces Dec. 21, 1976, after running aground six days earlier on its way to Salem with a load of 7.3 million gal. of heavy fuel oil.

Spilled Oil Research (SOR) Team established

– Nov 16, 1977 *Scientific Support Coordinator* established for emergency spill response assistance to the U.S. Coast Guard and EPA

AGENCY MISSION STATEMENT

The NOAA Office of Response and Restoration is guided by three goals in carrying out its stewardship responsibilities:

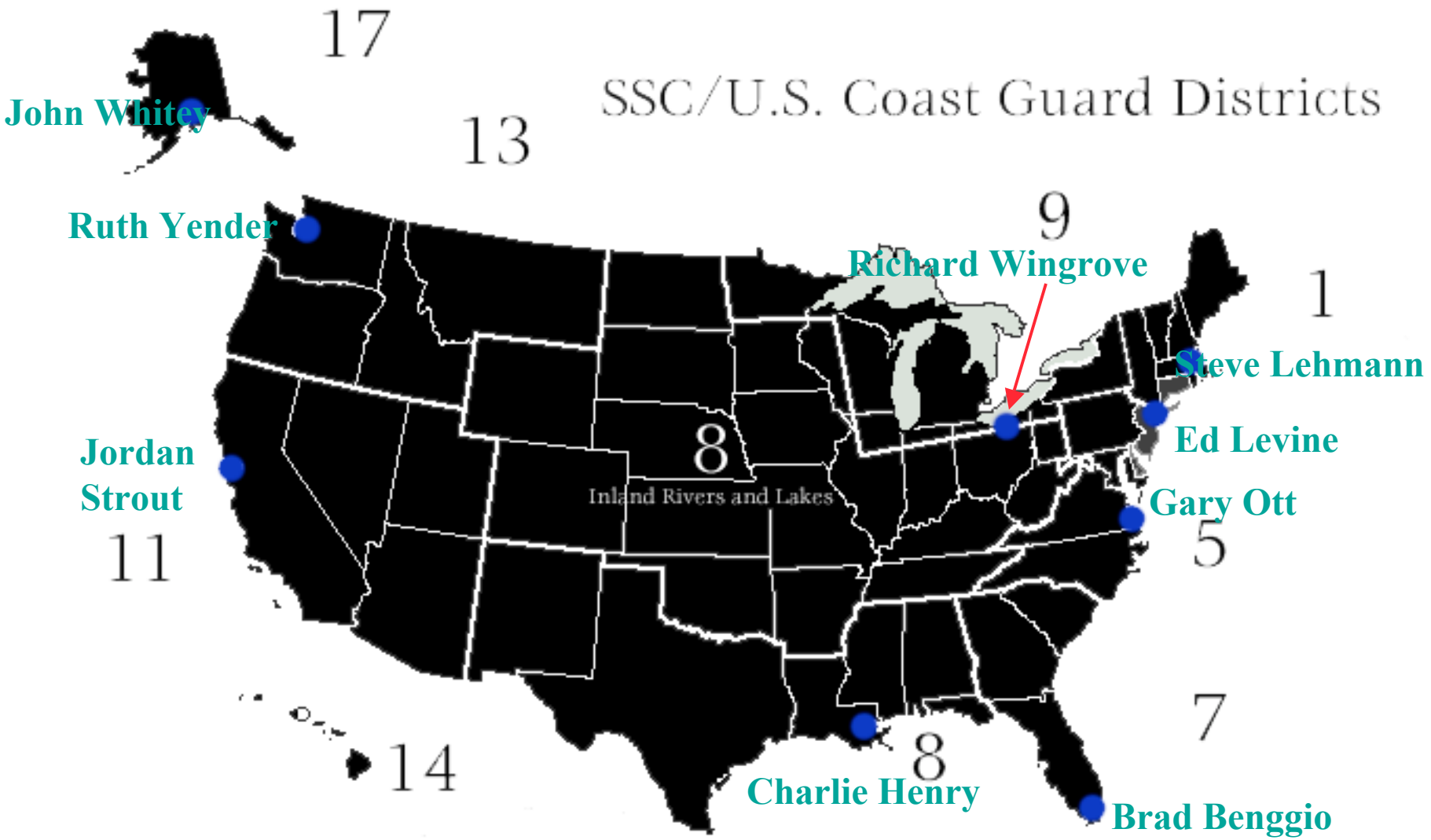
- Reducing threats to coastal resources and human health through planning and response.
- Protecting coastal resources and human health by recommending and implementing appropriate response actions.
- Restoring injured trust resources.

NOAA is part of the Special Forces to the FOSC

Not just another NOAA Scientist…

- …what is a Scientific Support Coordinator (SSC)?
- …see I.M.H., p15-22
  Incident Management Handbook
- …total of 9 SSCs


SSC/U.S. Coast Guard Districts
17
Anchorage
13
Seattle
9
Cleveland
1
Boston
New York
Long
Beach
8
Inland Rivers and Lakes
Norfolk
11
5
7
14
8
New Orleans
Miami


SSC/U.S. Coast Guard Districts
17
13
9
1
8
Inland Rivers and Lakes
11
5
7
14
8
John Whitey
Ruth Yender
Richard Wingrove
Steve Lehmann
Ed Levine
Jordan Strout
Gary Ott
Charlie Henry
Brad Benggio

Scientific Support Coordinator (SSC):

- SSCs provide the Federal On Scene Coordinator (FOSC) with scientific advice with regard to the best course of action during a spill response.
  - FOSC is most often the USCG COTP or an EPA OSC
  - SSC's do not restrict support to only the USCG and EPA
- The SSCs are essentially scientific-technical consultants to the FOSC for oil and hazardous material incidents. SSCs may be requested to respond to any emergency (all hazards).
- One of the identified Special Forces (just like the USCG Strike teams)

NOAA Scientific Support Includes:

- *Specialized Weather Forecast*
- *Tides and Currents*
- *Hazard Characterization*
- *Tactical Trajectory*
- *Natural Resources at Risk (RAR)*
- *Overflight Obsevation*
- *SCAT*
- *Environmental issues and trade-offs*
- *Consultation*

Science Team Composition

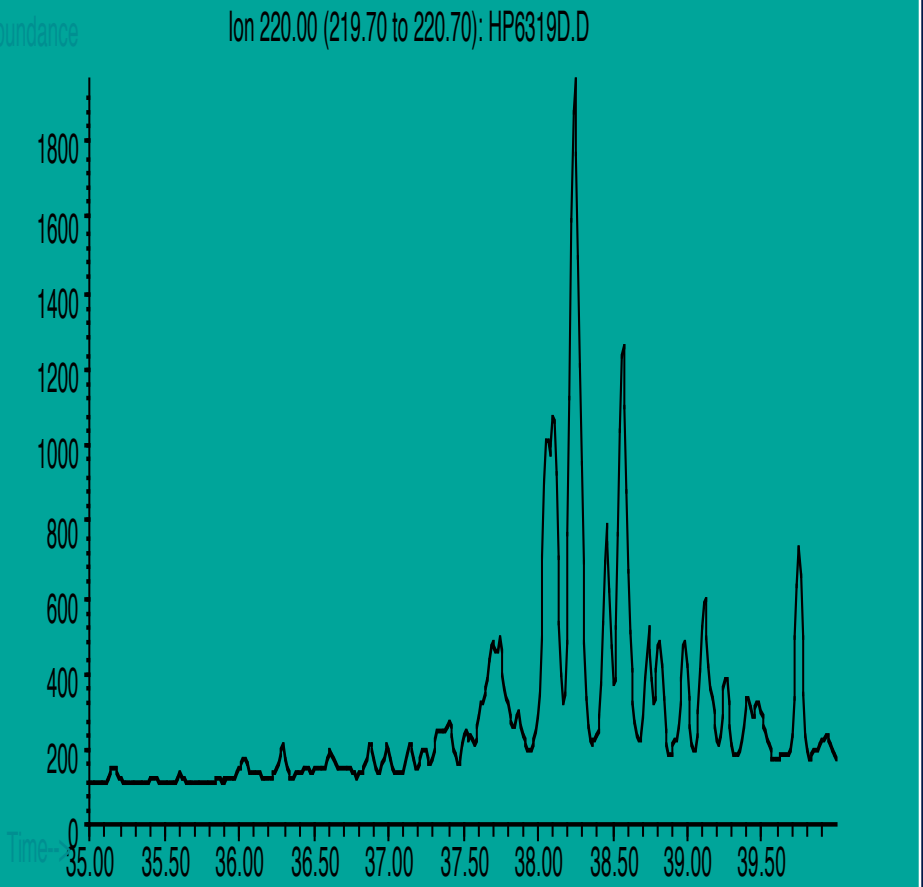
(the guys and gals who make the SSC look good)

- SSC's manage a team of scientist:
  - Oceanographers
  - Modelers
  - Biologists
  - Chemists
  - Meteorologists
  - Info. Management Specialists

- Each spill is unique and the team composition highly variable to meet the needs and demands of the FOSC.

(25 plus years of corporate knowledge)

Chemical Fingerprinting

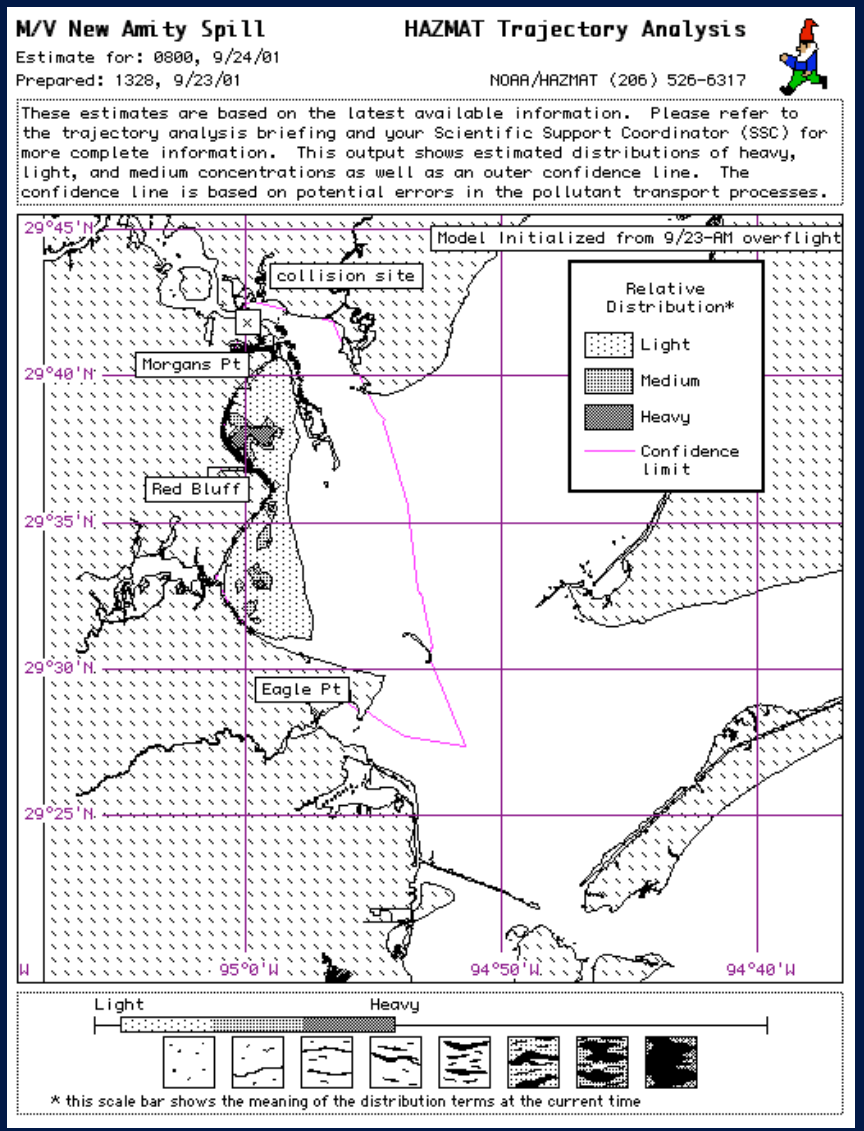


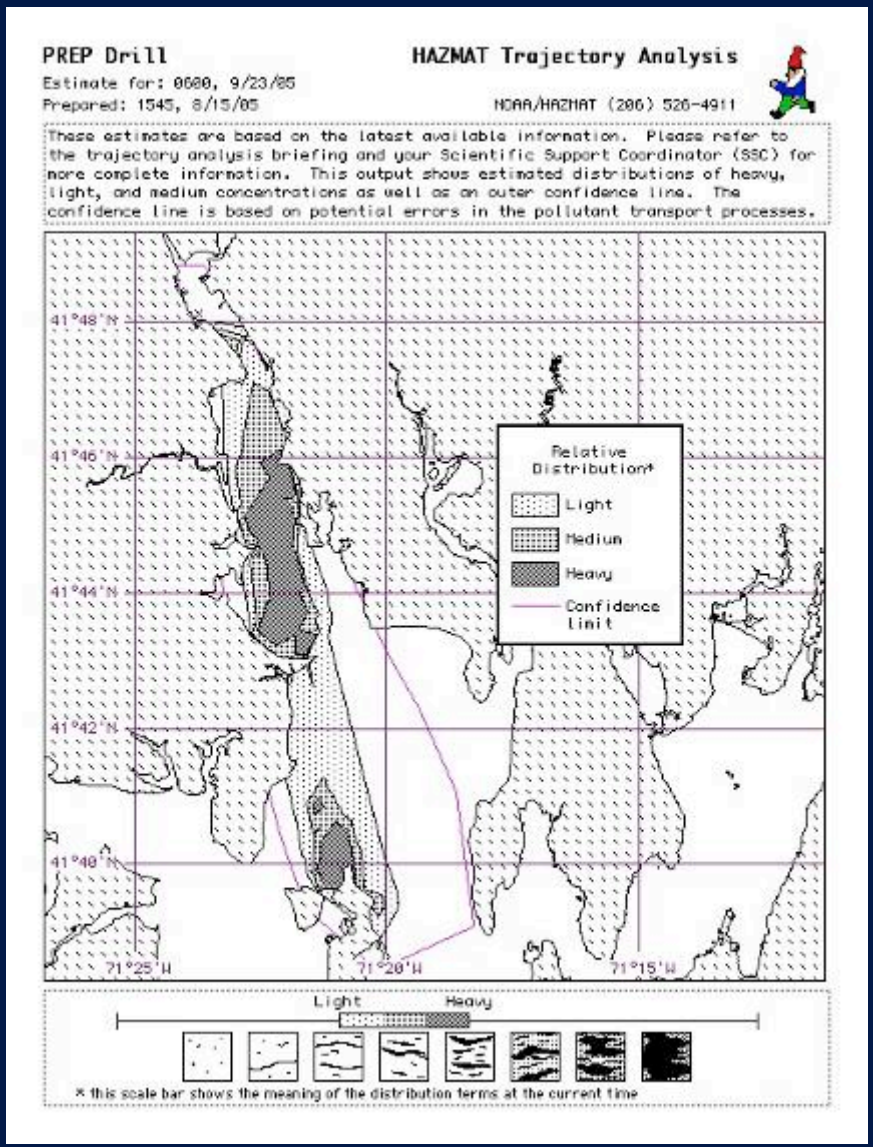
Pollutant Transport/Weathering Modeling

- Interpretive Oil Trajectories (Forecasts)
  - Verbal Forecast
  - Written Forecast
- Modeling Products
  - ALOHA
  - OSSM
  - GNOME
  - ADIOS2

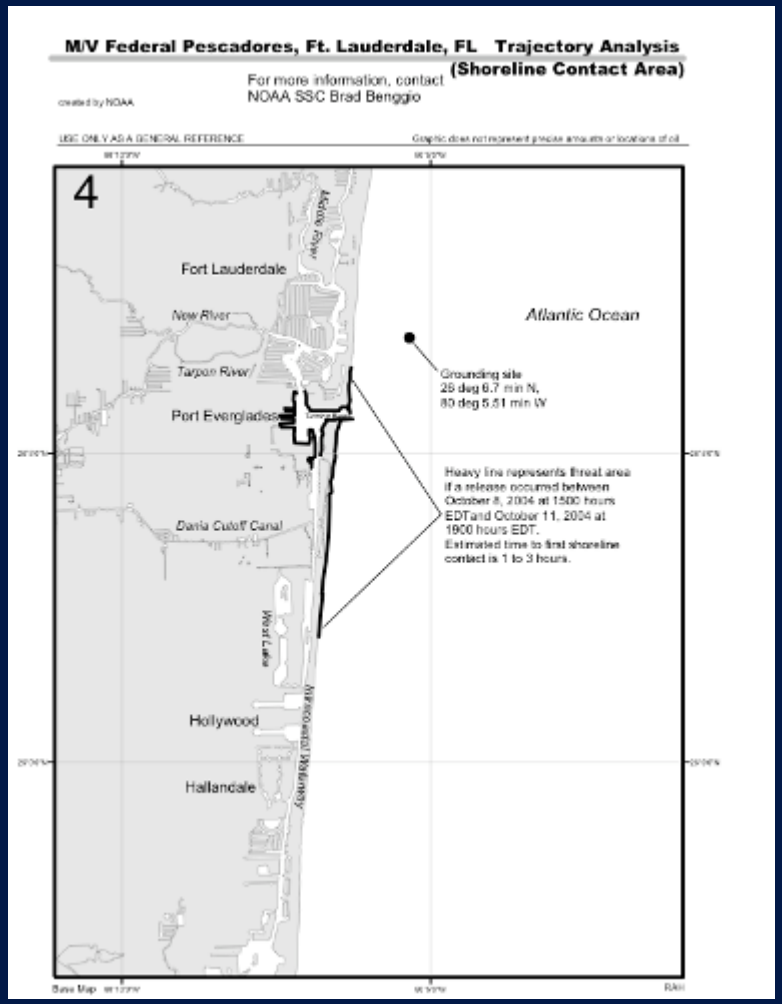
surface transport drivers include wind, currents, and tides

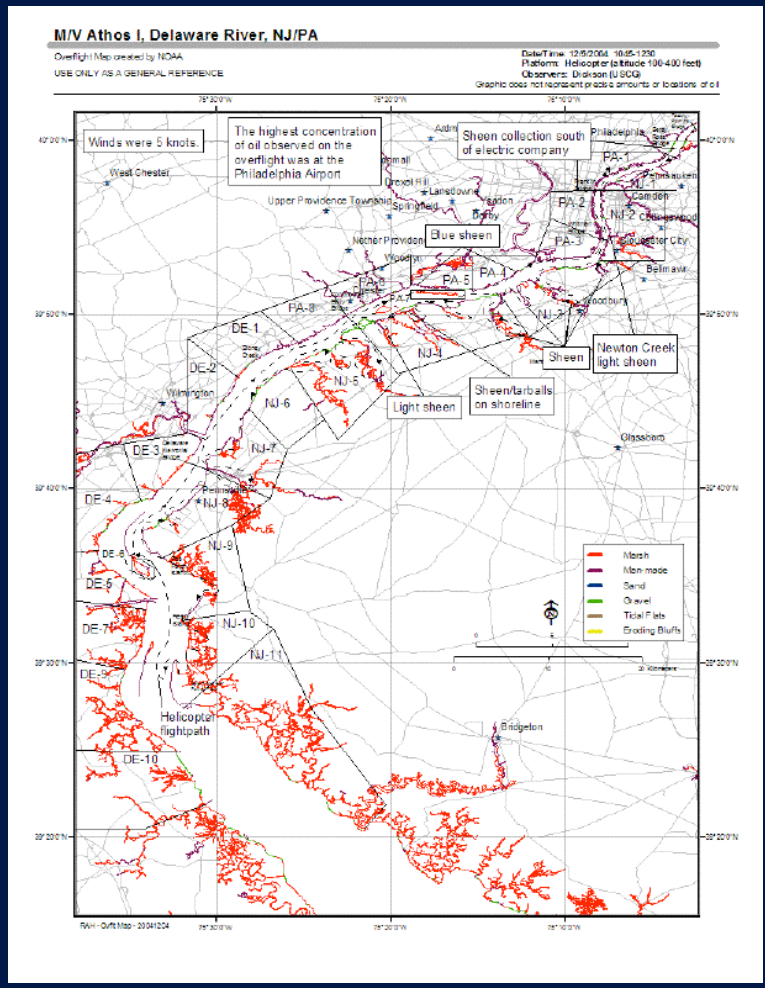
Tactical Planning - Trajectory Analysis



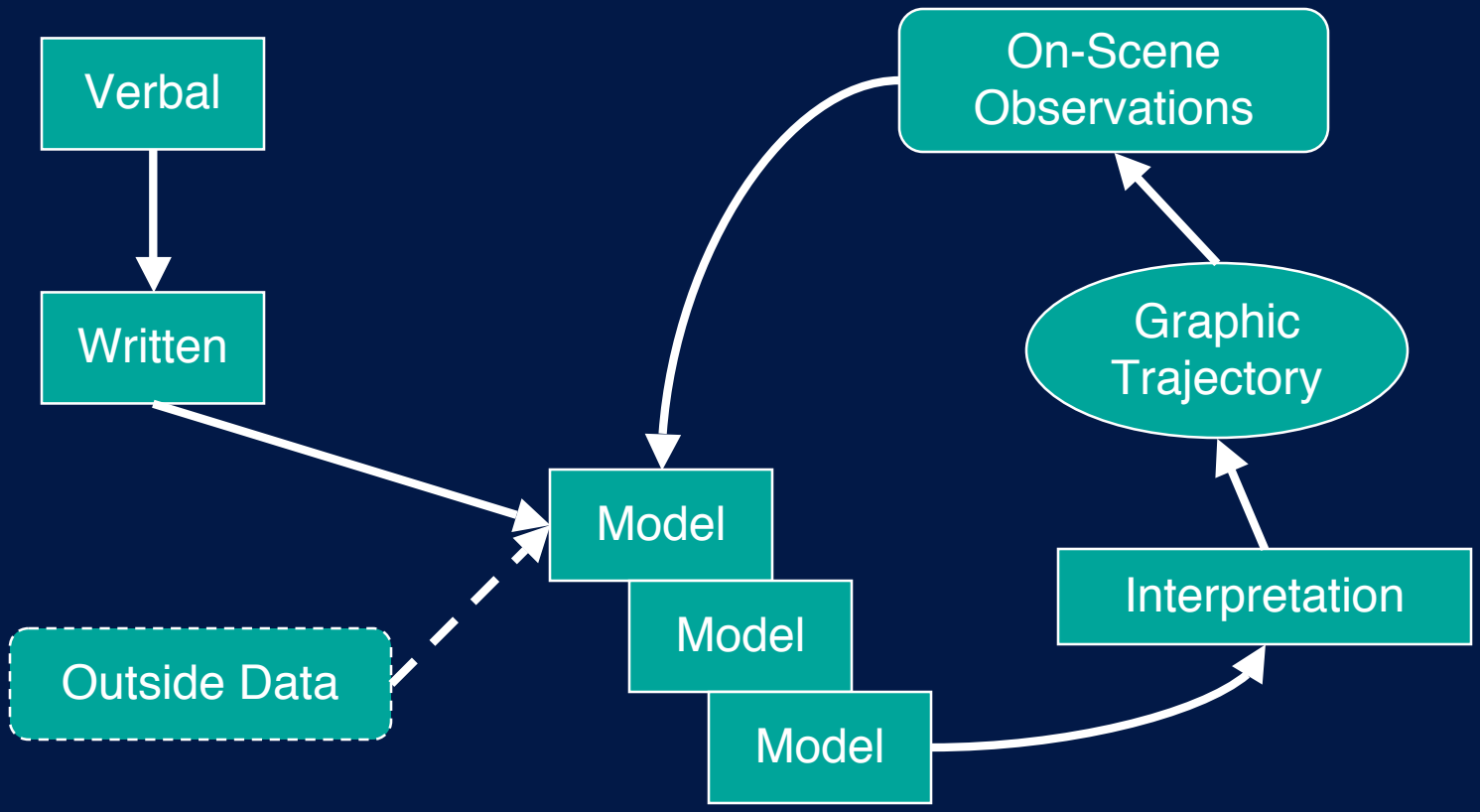


Oil Spill Tracking and Documentation





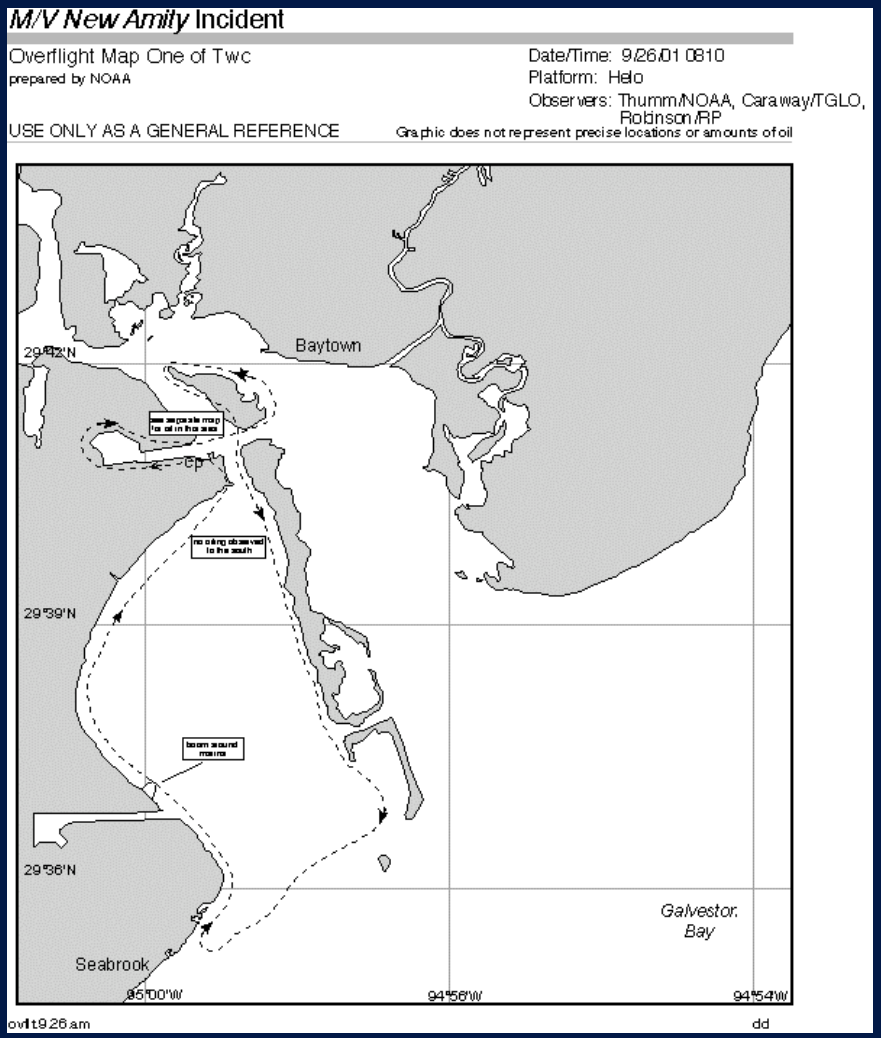
The Process


Verbal
Written
Outside Data
On-Scene Observations
Graphic Trajectory
Interpretation
Model
Model
Model

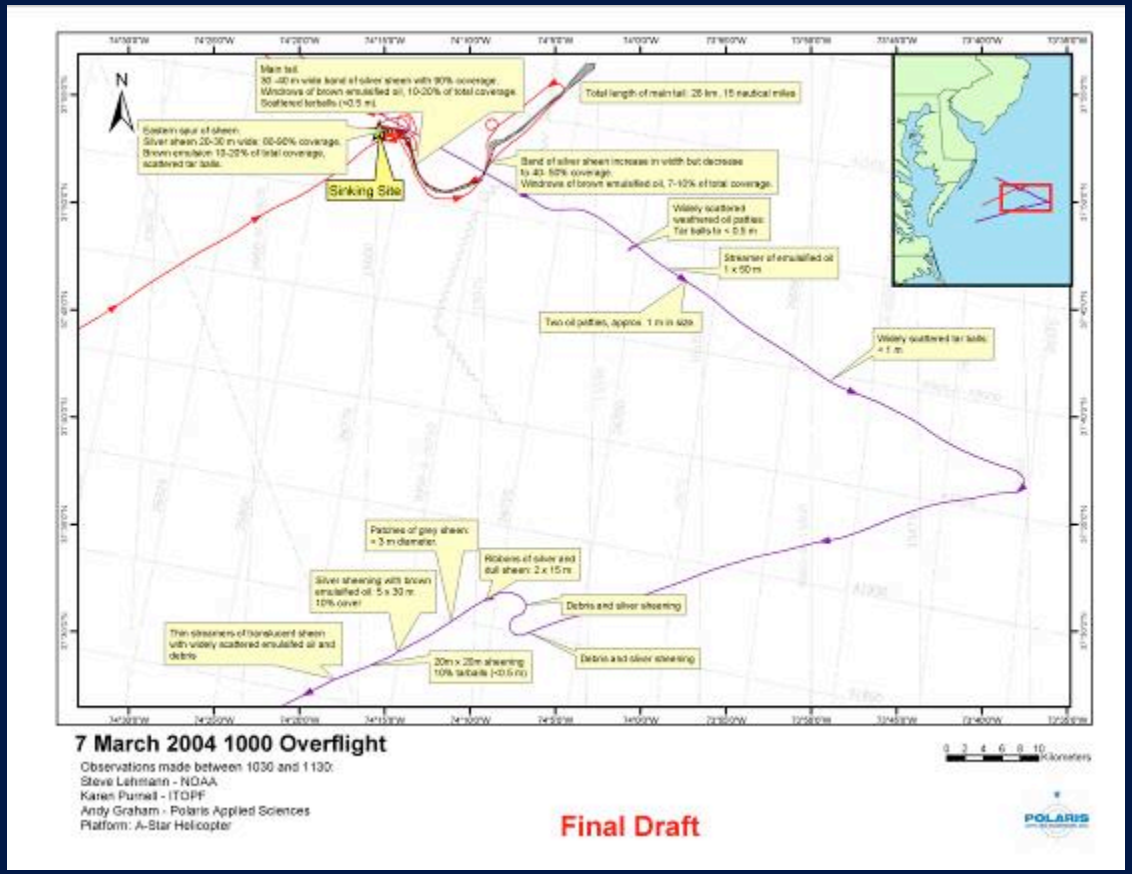
Overflights

On-Scene Observations

Oil Spill Tracking and Documentation



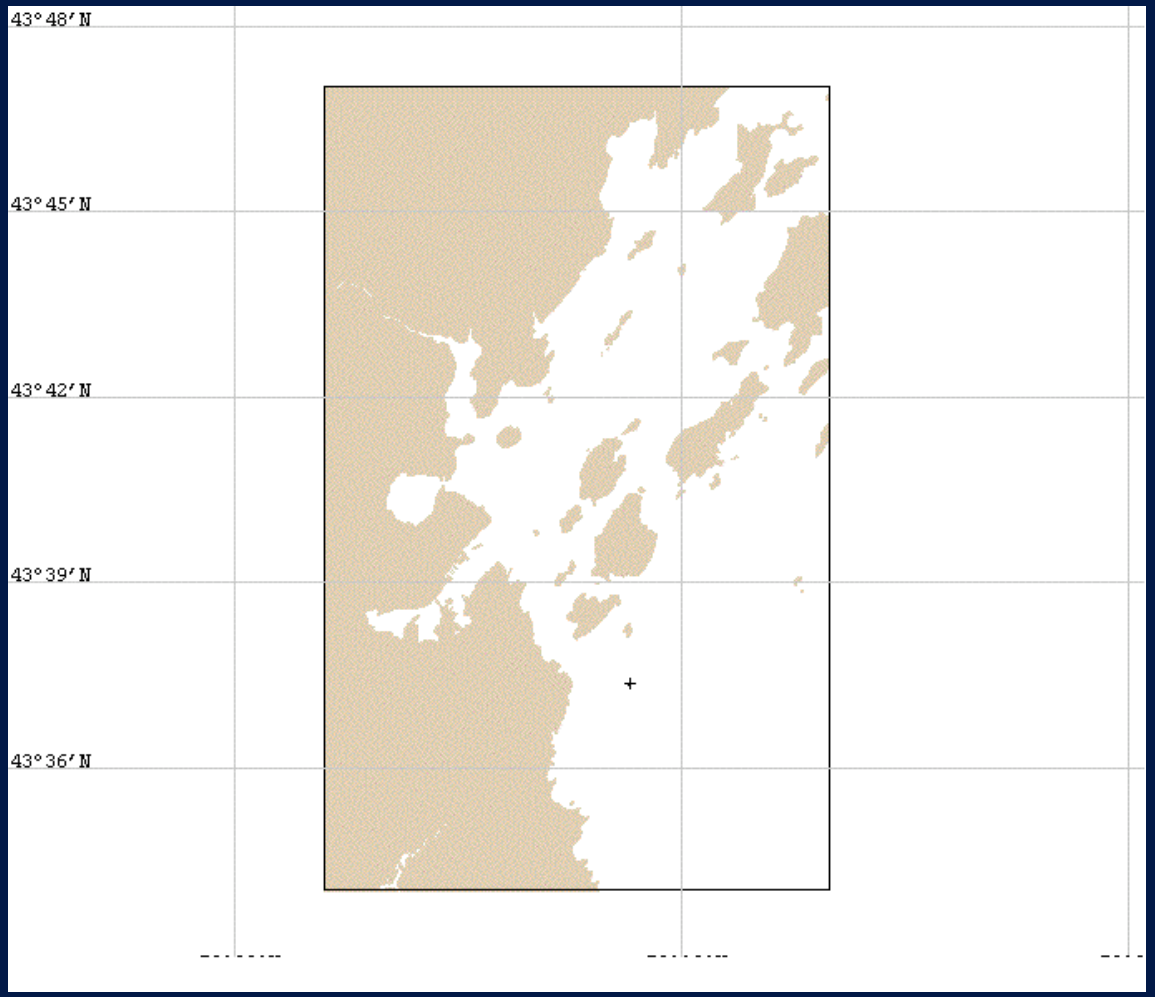
Oil Spill Tracking and Documentation



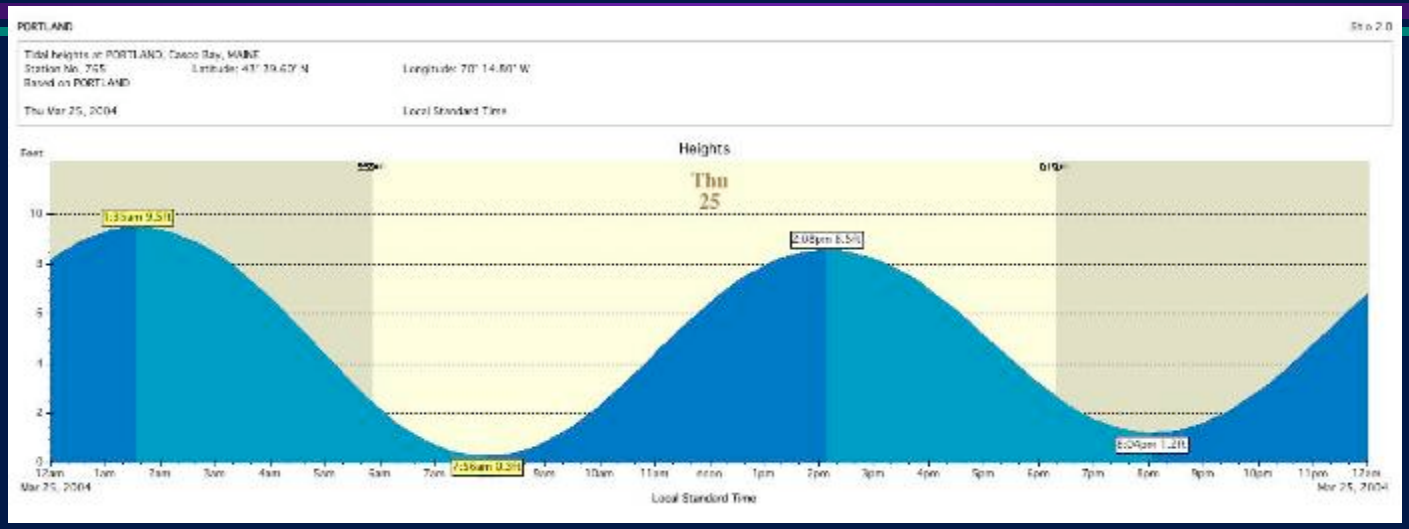
NOAA Software

- GNOME
- SHIO
- ADIOS
- CAMEO
- ALOHA
- ESI-Viewer

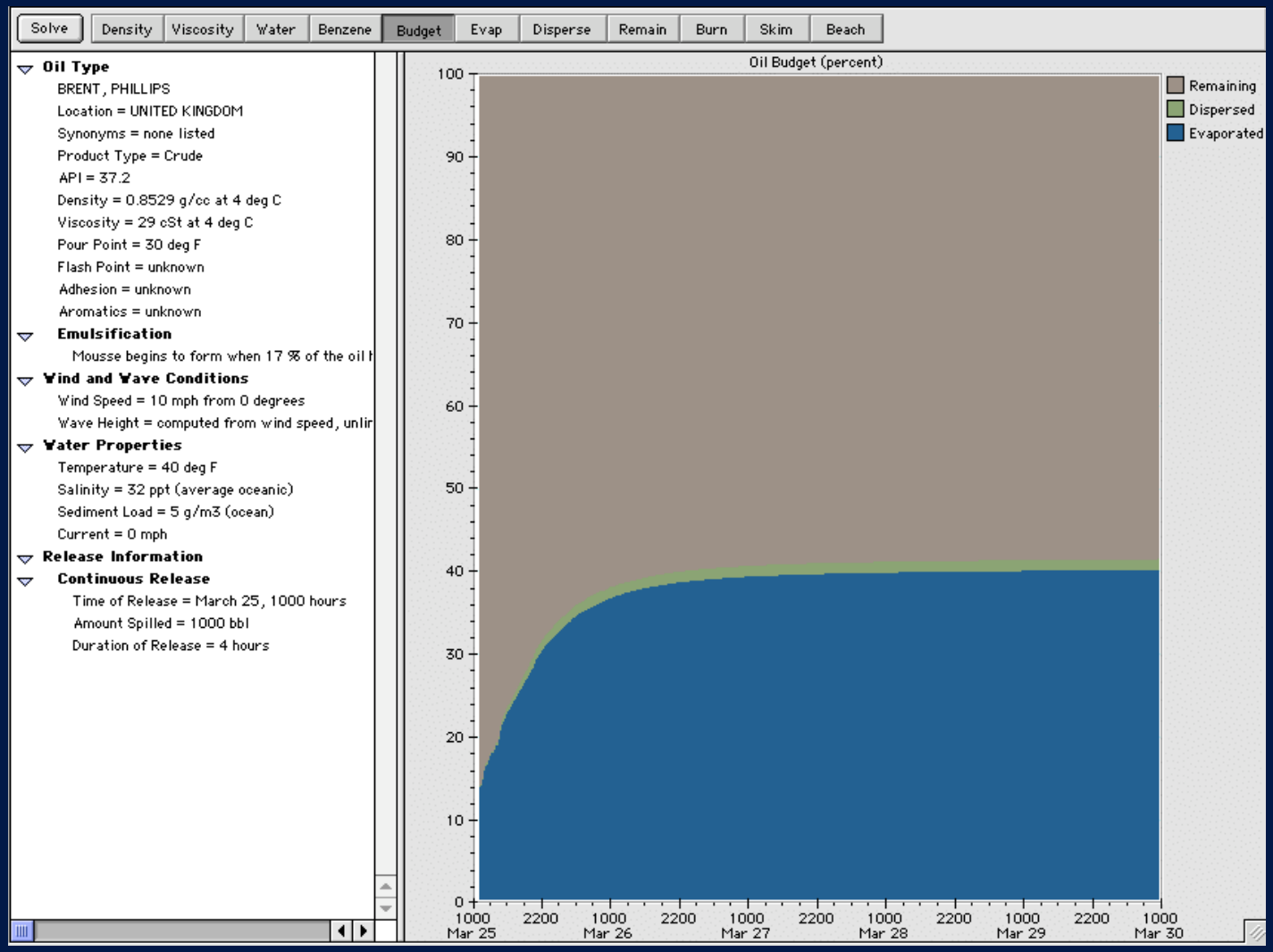
GNOME: Planning Tool



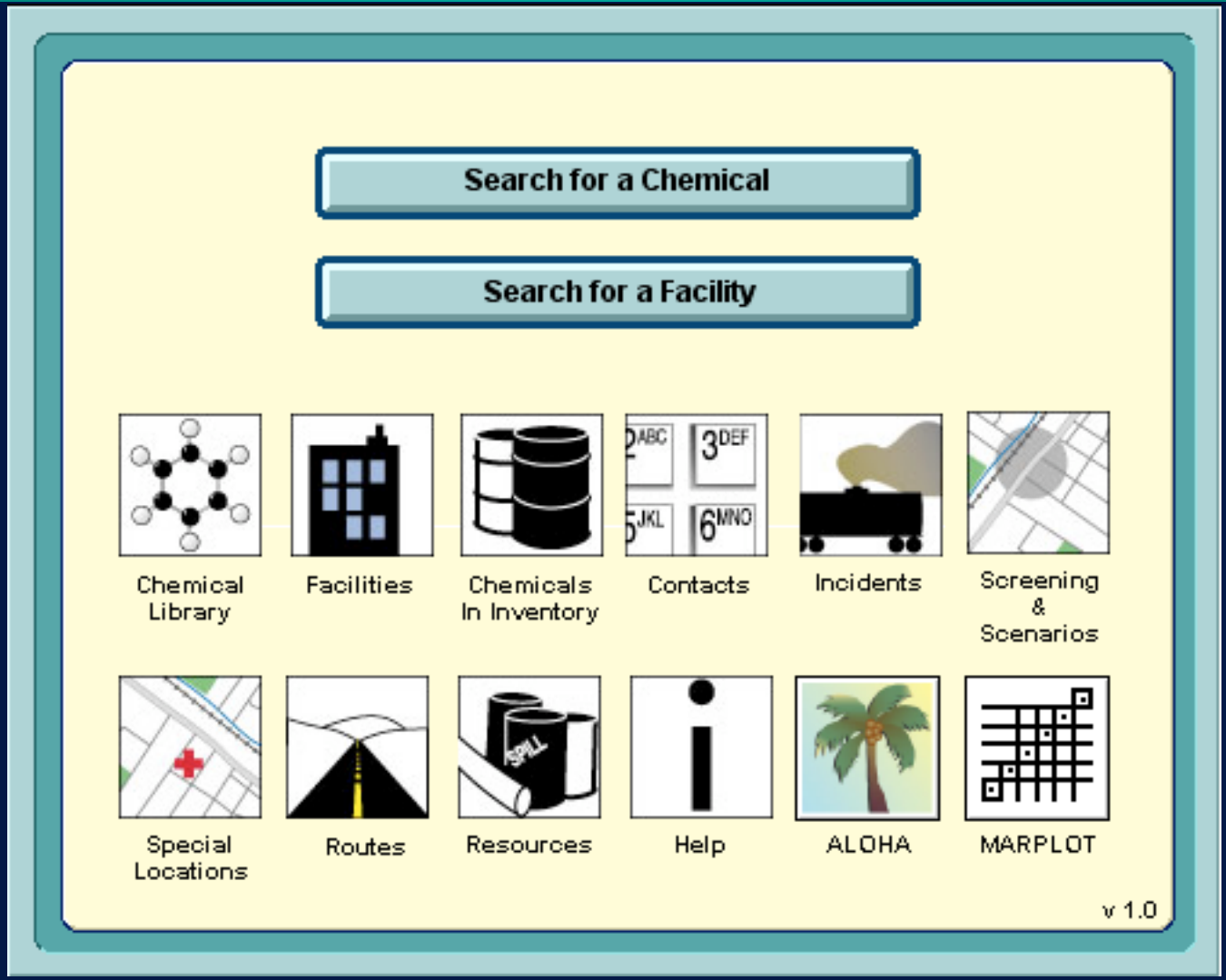
Tidal Height & Current Predictions (SHIO)



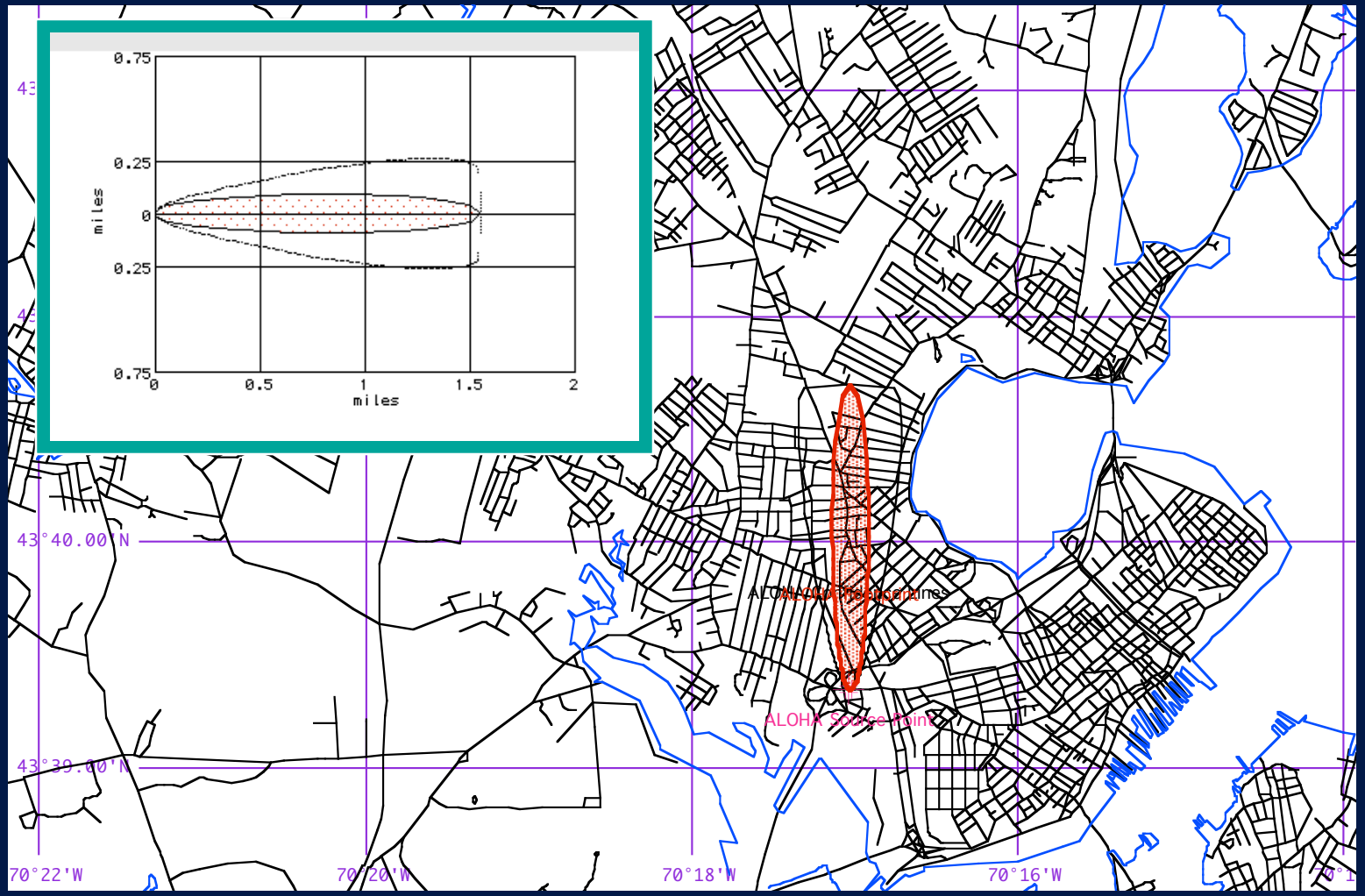
Oil Fate Prediction (ADIOS)



CAMEOfm


Search for a Chemical
Search for a Facility
Chemical Library
Facilities
Chemicals In Inventory
Contacts
Incidents
Screening & Scenarios
Special Locations
Routes
Resources
Help
ALOHA
MARPLOT
v 1.0

ALOHA Air Model

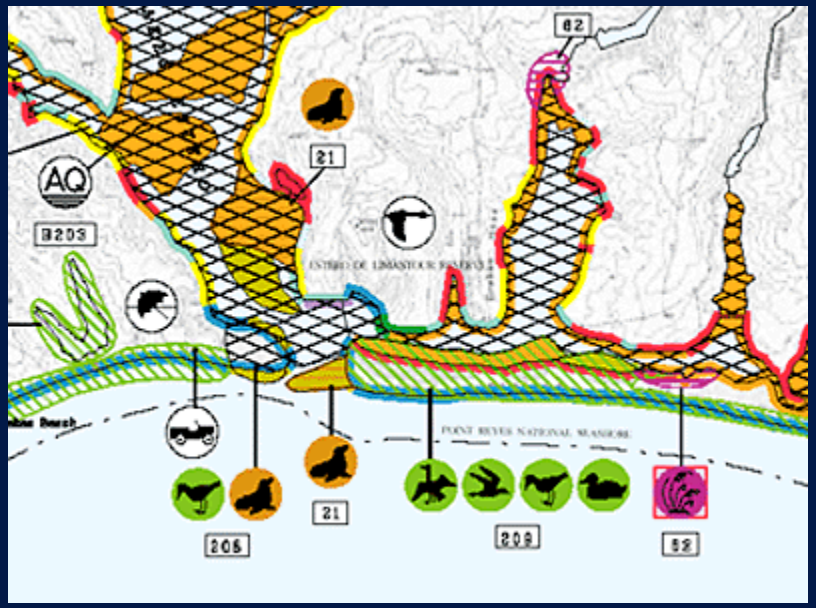


Shoreline
Cleanup
Assessment
Team

Natural Resources at Risk

- ESIs
- ESI Maps
- RARs
- Endangered Species
- Manager Consultations
  - Planning
  - Spill Response
  - Post-Incident
  - Ecological Risk Assessments

NOAA Trust Resources



Setting Priorities

National Oceanic and Atmospheric Administration

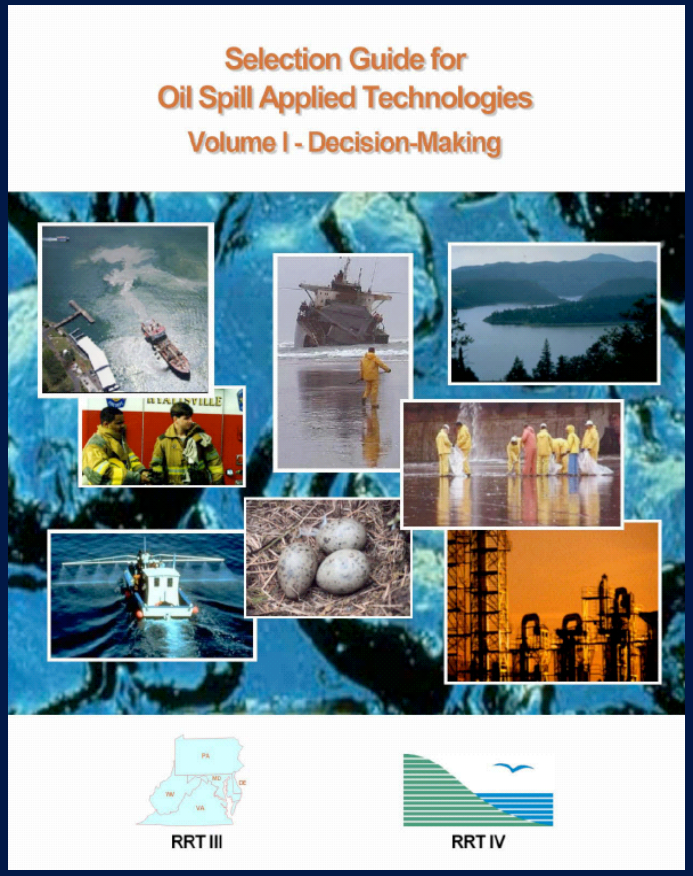
Stewards of the Nation's Coastal Environment

Trustee Role

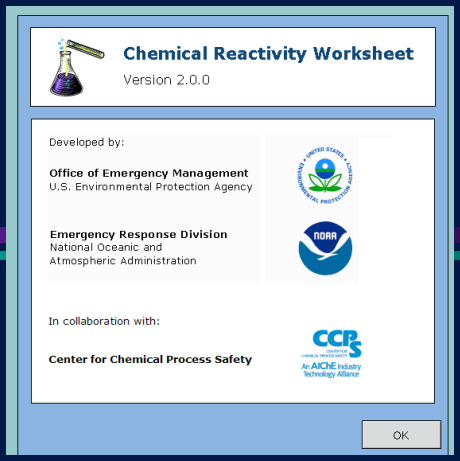
Research & Development

What is the Selection Guide

- The Selection Guide is a compilation of information and guidance on the use of oil spill response technologies and actions that may be unfamiliar to Federal or state on-scene coordinators or local incident commanders.

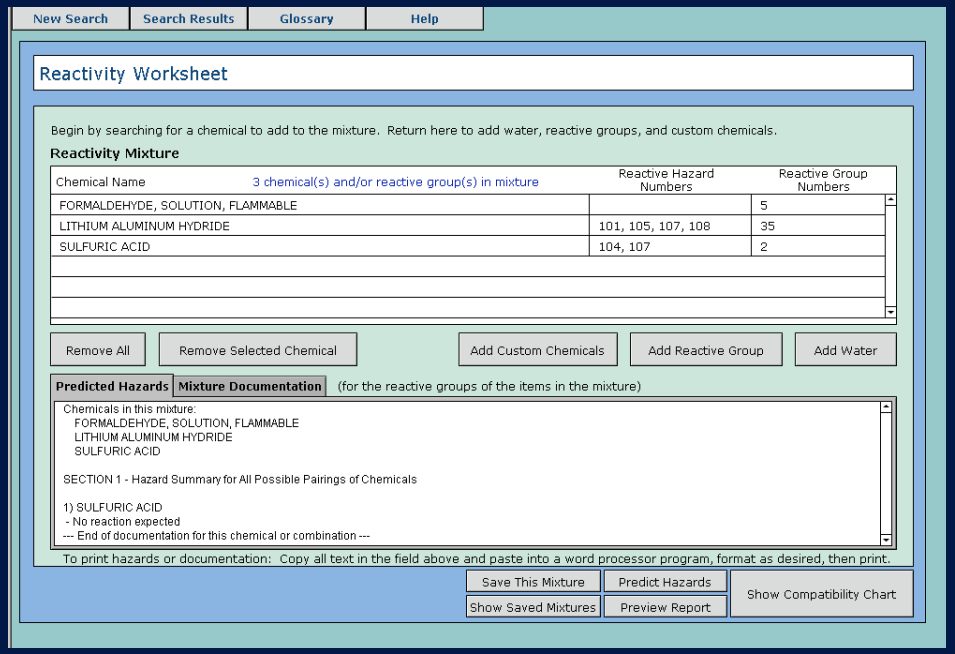


Chemical Reactivity Worksheet 2.0 predicts the hazards associated with mixing chemicals and identifies chemicals' intrinsic hazards



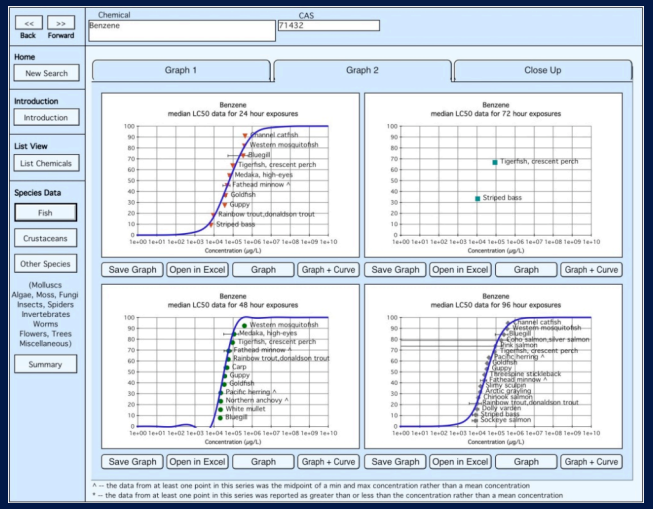
New Features

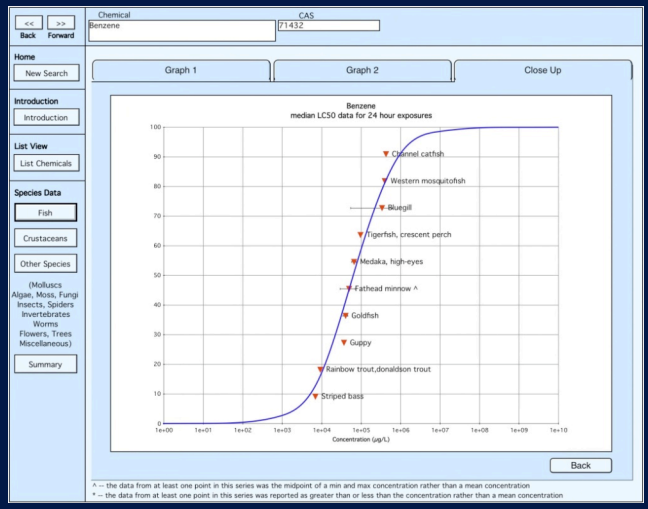
- User-generated proprietary chemical database
- The naming of Potential Gases generated by the mixture of combinations of chemicals
- The ability to add water to the mixture and generate a hazard prediction



Chemical Aquatic Fate and Effects Database (CAFE)

A quick reference for spills in aquatic environments

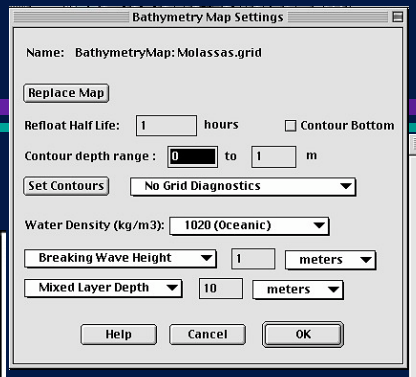


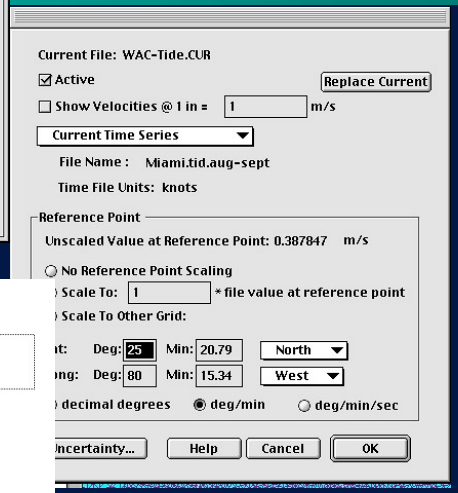


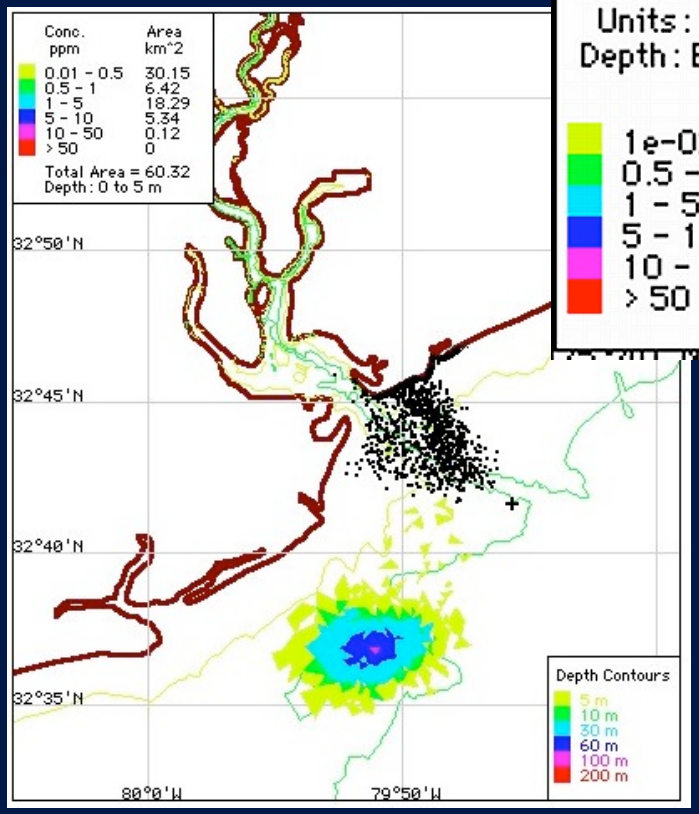
- Includes over 30,000 chemicals
- Contains data concerned with chemical fate in an aquatic environment, including physical properties, fugacity model results, rate constants (hydrolysis half lives, etc.), and much more….
- Contains all aquatic organism LC50 data from EPA's ECOTOX Database in user-friendly graphing representation. This provides the user a quick assessment of the degree of severity that the chemical poses to the aquatic ecology.

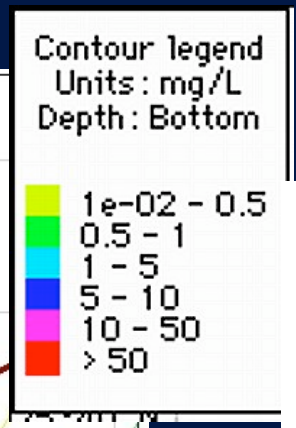
3D GNOME

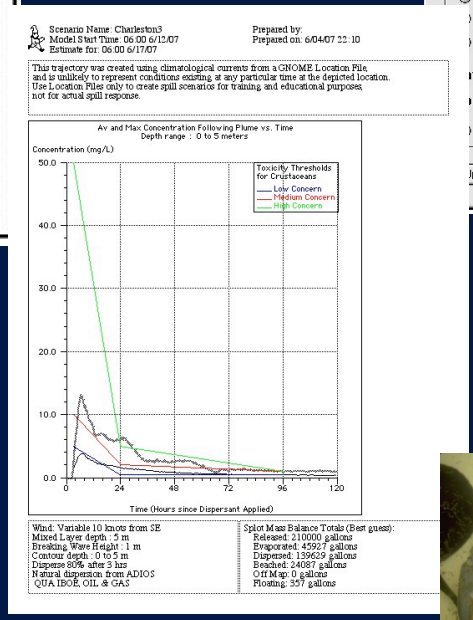

?


Bathymetry Map Settings
Name: BathymetryMap: Molassas.grid
Replace Map
Refloat Half Life: 1 hours
Contour Bottom
Contour depth range : 0 to 1 m
Set Contours
No Grid Diagnostics
Water Density (kg/m3): 1020 (Oceanic)
Breaking Wave Height 1 meters
Mixed Layer Depth 10 meters
Help
Cancel
OK

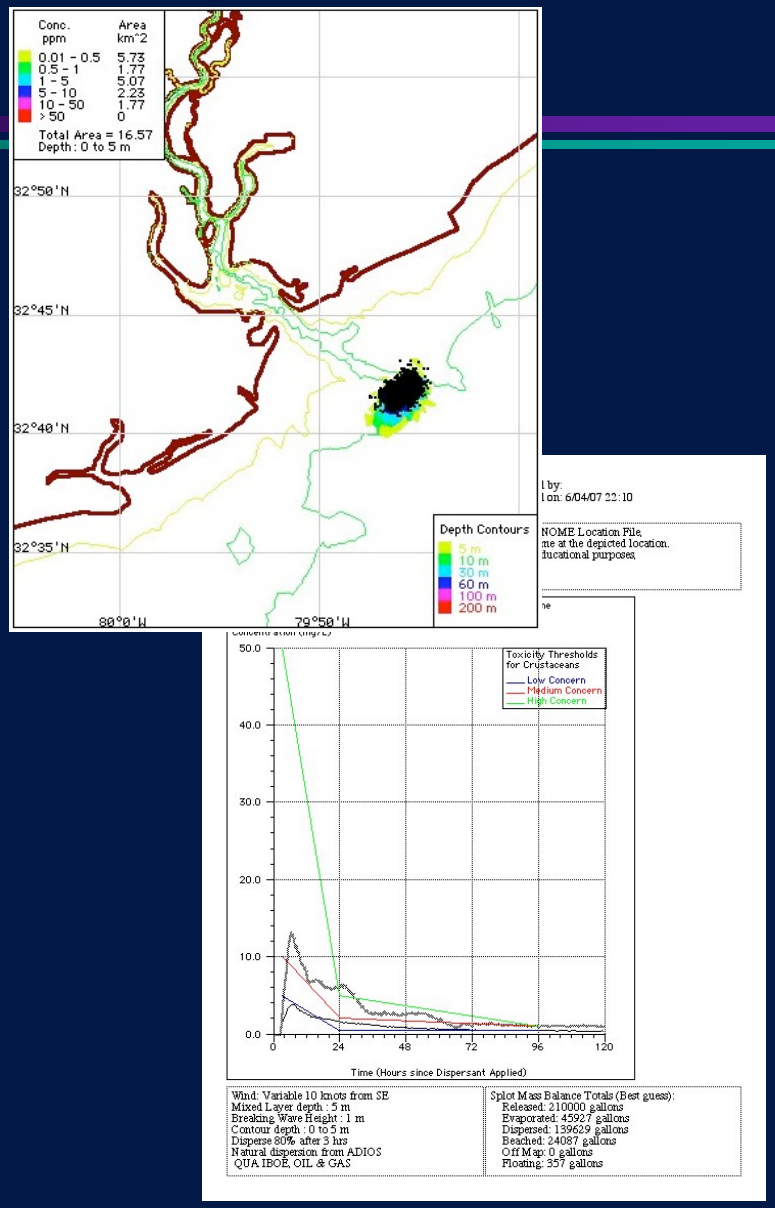

Current File: WAC-Tide.CUR
Active
Replace Current
Show Velocities @ 1 in = 1 m/s
Current Time Series
File Name : Miami.tid.aug-sept
Time File Units: knots
Reference Point
Unscaled Value at Reference Point: 0.387847 m/s
No Reference Point Scaling
Scale To: 1 * file value at reference point
Scale To Other Grid:
Deg: 25 Min: 20.79 North
Deg: 80 Min: 15.34 West
decimal degrees
deg/min
deg/min/sec
Help
Cancel
OK

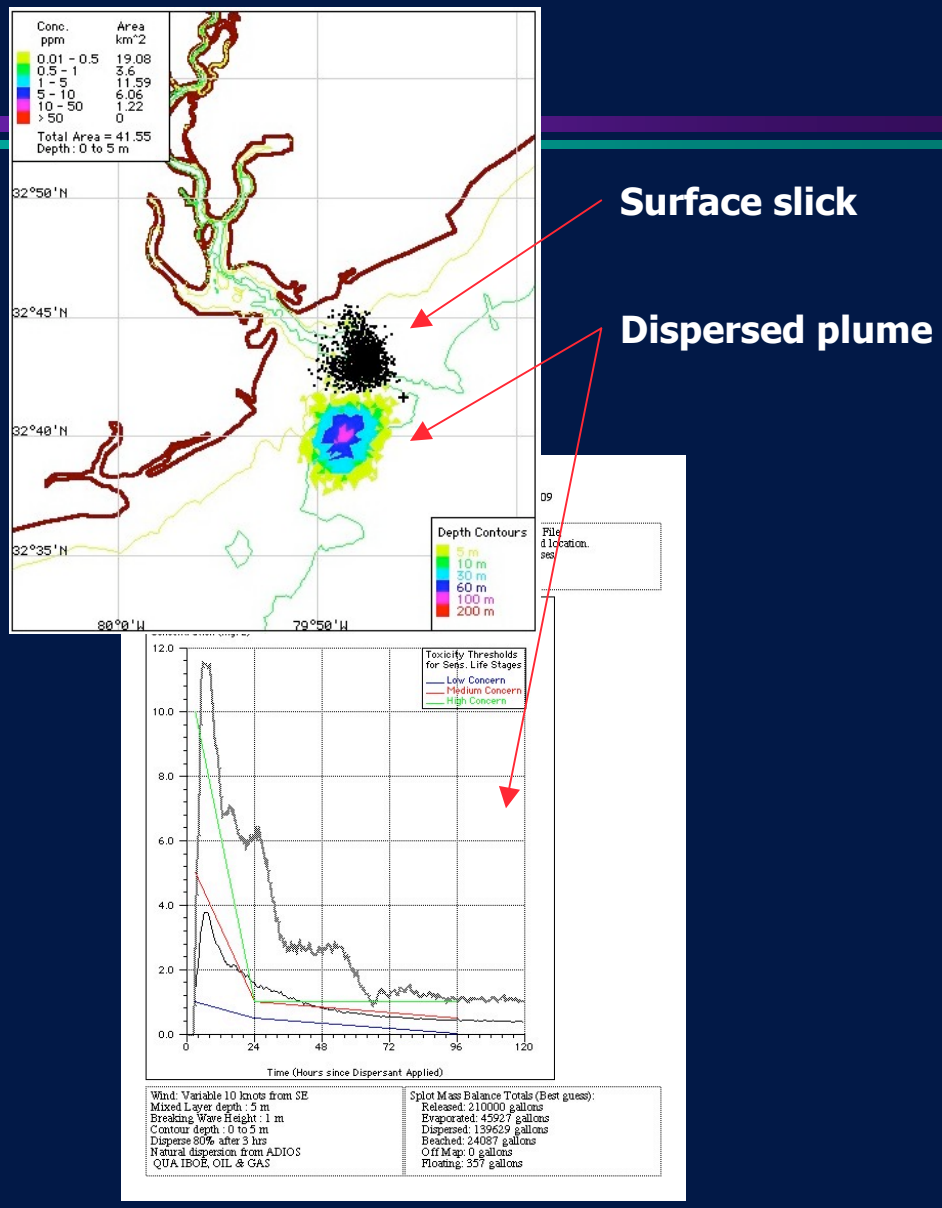

Conc. ppm
Area km^2
0.01 - 0.5 30.15
0.5 - 1 6.42
1 - 5 18.29
5 - 10 5.34
10 - 50 0.12
> 50 0
Total Area = 60.32
Depth : 0 to 5 m
32°50'N
32°45'N
32°40'N
32°35'N
80°0'W
79°50'W
Depth Contours
5 m
10 m
30 m
60 m
100 m
200 m


Contour legend
Units : mg/L
Depth : Bottom
1e-02 - 0.5
0.5 - 1
1 - 5
5 - 10
10 - 50
> 50


Scenario Name: Charleston3
Model Start Time: 06:00 6/12/07
Estimate for: 06:00 6/17/07
Prepared by:
Prepared on: 6/04/07 22:10
This trajectory was created using climatological currents from a GNOME Location File, and is unlikely to represent conditions existing at any particular time at the depicted location. Use Location Files only to create spill scenarios for training and educational purposes, not for actual spill response.
Av and Max Concentration Following Plume vs. Time
Depth range : 0 to 5 meters
Concentration (mg/L)
Toxicity Thresholds for Crustaceans
Low Concern
Medium Concern
High Concern
Time (Hours since Dispersant Applied)
Wind: Variable 10 knots from SE
Mixed Layer depth : 5 m
Breaking Wave Height : 1 m
Contour depth : 0 to 5 m
Disperse 80% after 3 hrs
Natural dispersion from ADIOS
QUA IBOE, OIL & GAS
Splot Mass Balance Totals (Best guess):
Released: 210000 gallons
Evaporated: 45927 gallons
Dispersed: 139629 gallons
Beached: 24087 gallons
Off Map: 0 gallons
Floating: 357 gallons

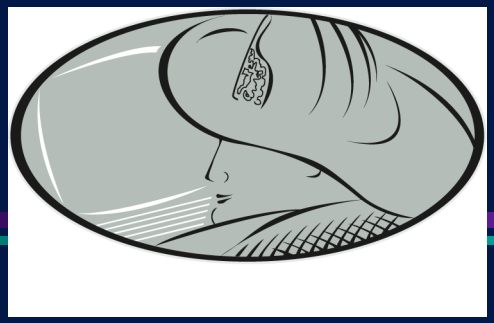
Out of sight … Not out of mind





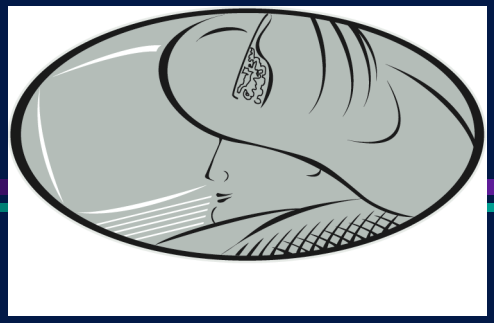
Surface slick

Dispersed plume



New CAMEO

- Popular CAMEO Chemicals online tool now available as a standalone application
- Updated chemical data and replaces Chemical Library (interacts with ALOHA and MARPLOT)
- Enhanced DOT data from ERG 2008 and 49CFR - Isolation Distances, Hazard Class, Placards
- Enhanced Reactivity data and predictor - gas byproducts, hazard statements



New MARPLOT

- New “Google Map”-like interface
- Web access/auto load for maps and population data for entire US
- Aerial and topographic maps
- Use on-line or off-line (user can download maps to local machine)
- Add new map data from other GIS’s

E - SCAT

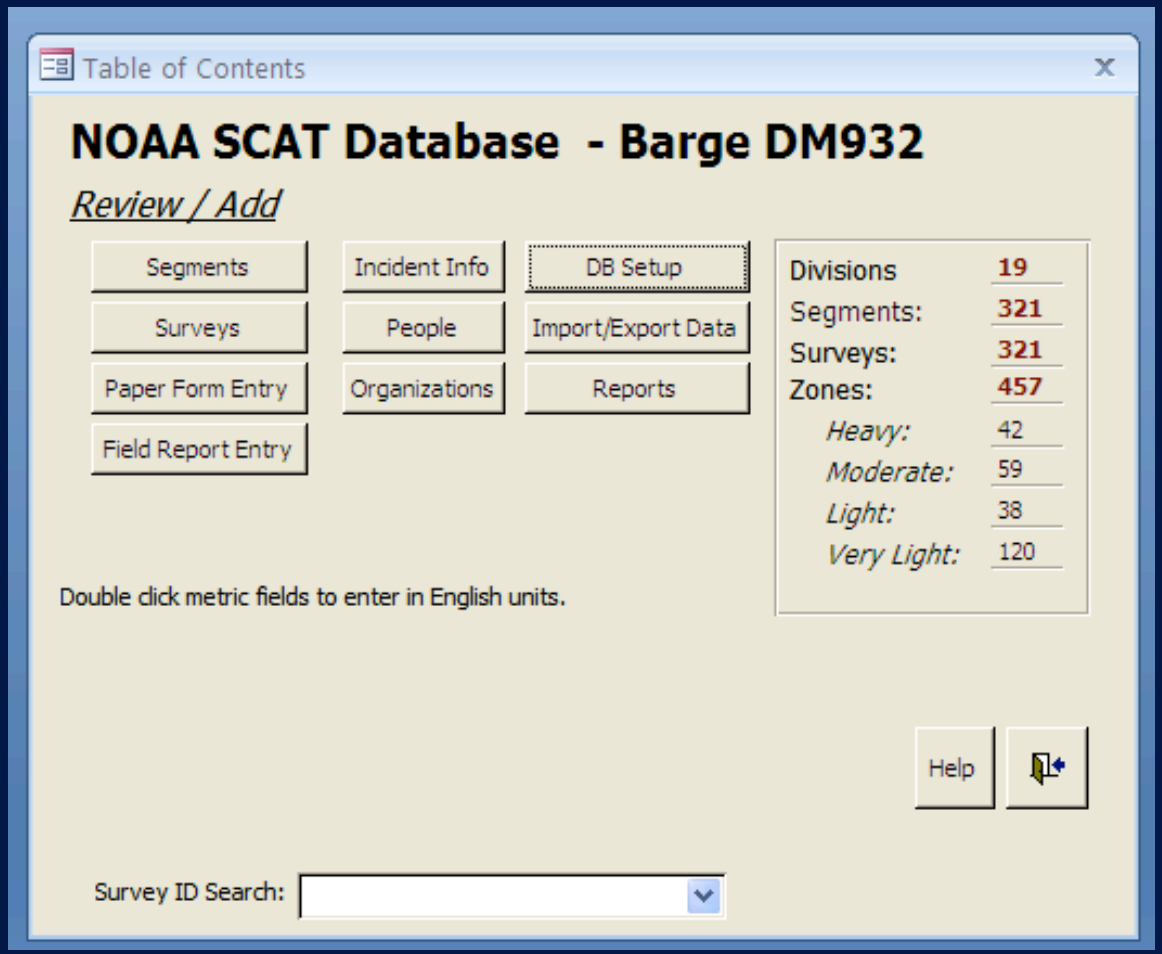
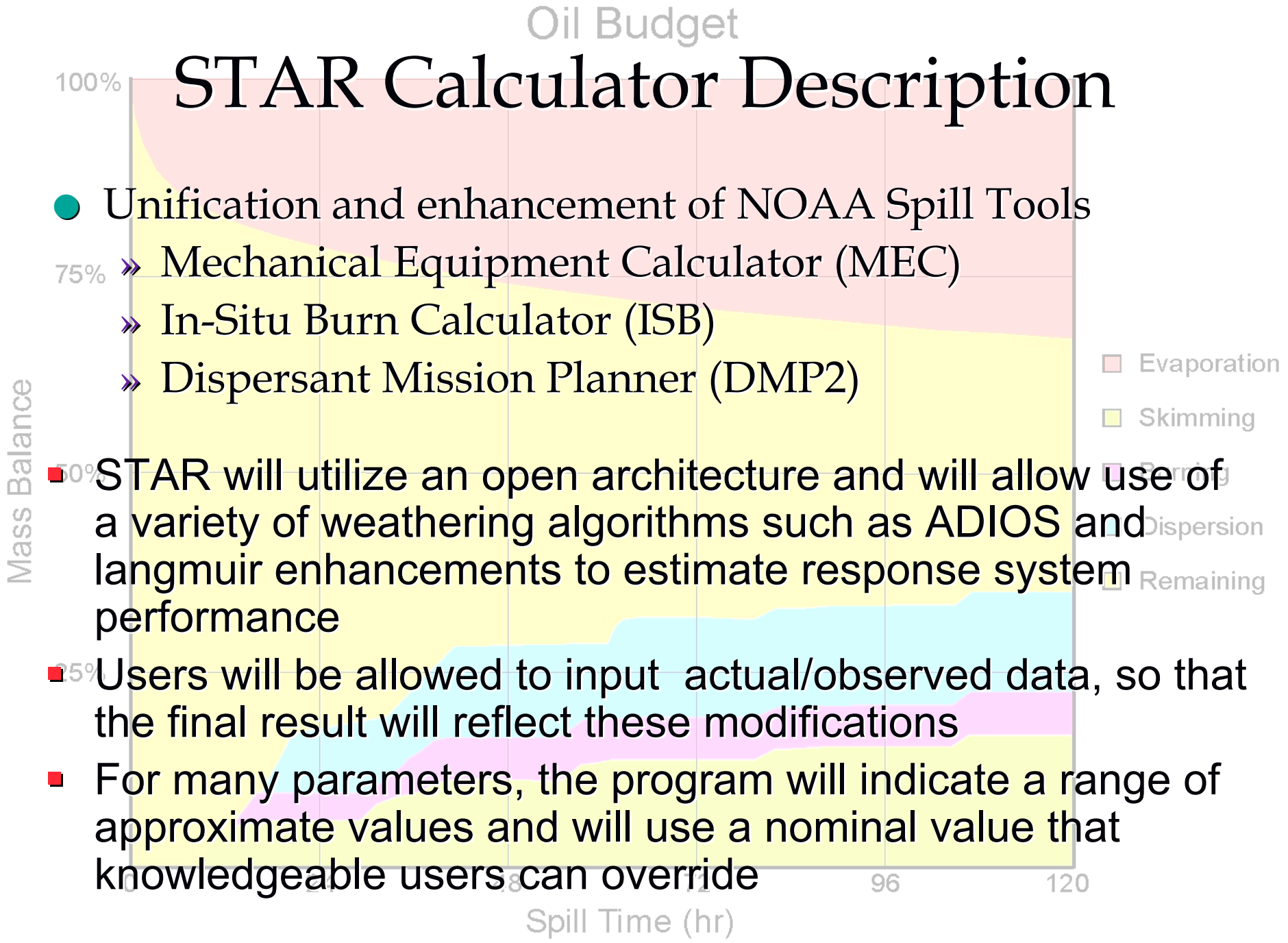


Table of Contents
NOAA SCAT Database - Barge DM932
Review / Add
Segments
Incident Info
DB Setup
Surveys
People
Import/Export Data
Paper Form Entry
Organizations
Reports
Field Report Entry
Divisions 19
Segments: 321
Surveys: 321
Zones: 457
Heavy: 42
Moderate: 59
Light: 38
Very Light: 120
Double click metric fields to enter in English units.
Help
Survey ID Search:

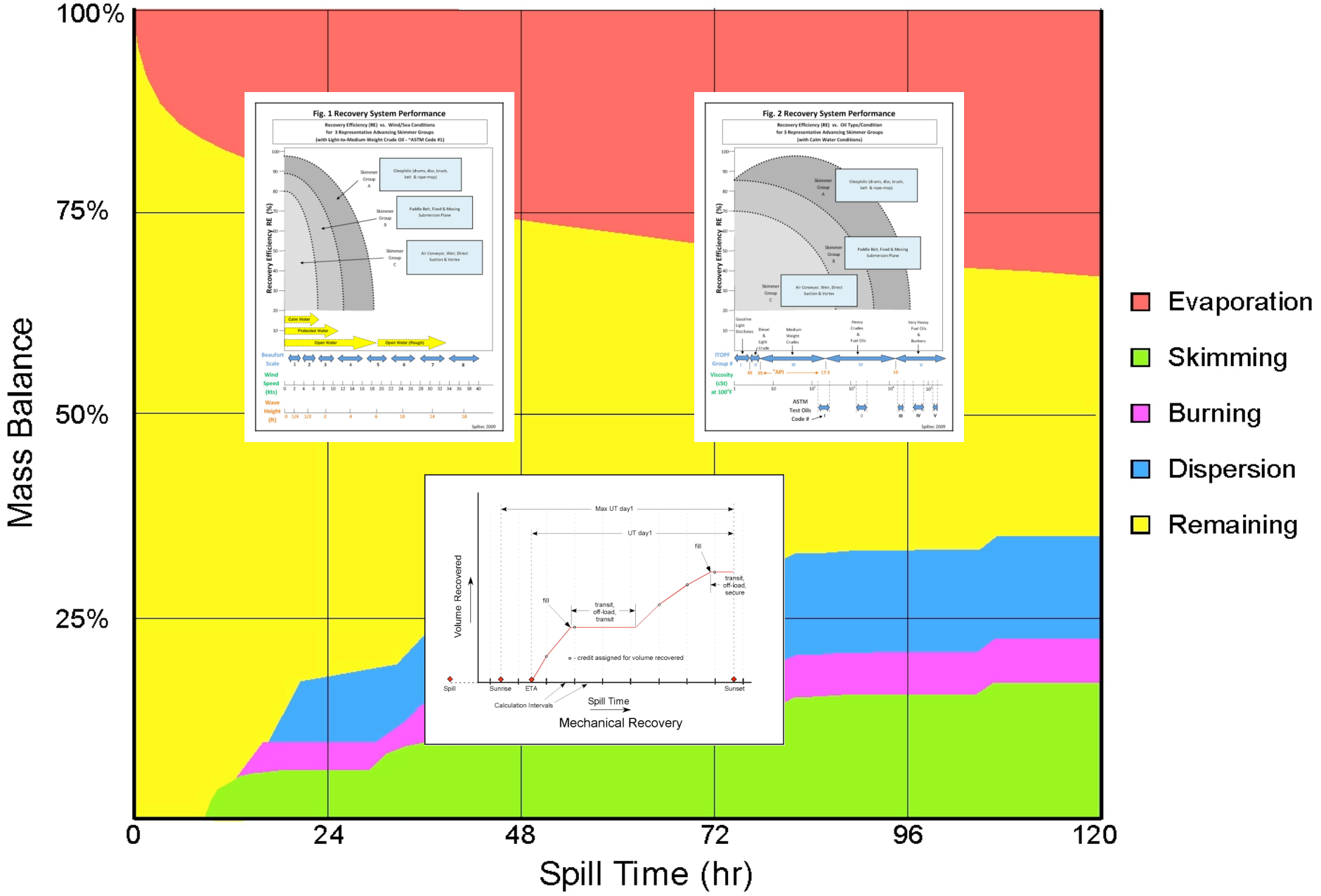
STAR Calculator Description

- Unification and enhancement of NOAA Spill Tools
  - » Mechanical Equipment Calculator (MEC)
  - » In-Situ Burn Calculator (ISB)
  - » Dispersant Mission Planner (DMP2)

- STAR will utilize an open architecture and will allow use of a variety of weathering algorithms such as ADIOS and langmuir enhancements to estimate response system performance
- Users will be allowed to input actual/observed data, so that the final result will reflect these modifications
- For many parameters, the program will indicate a range of approximate values and will use a nominal value that knowledgeable users can override

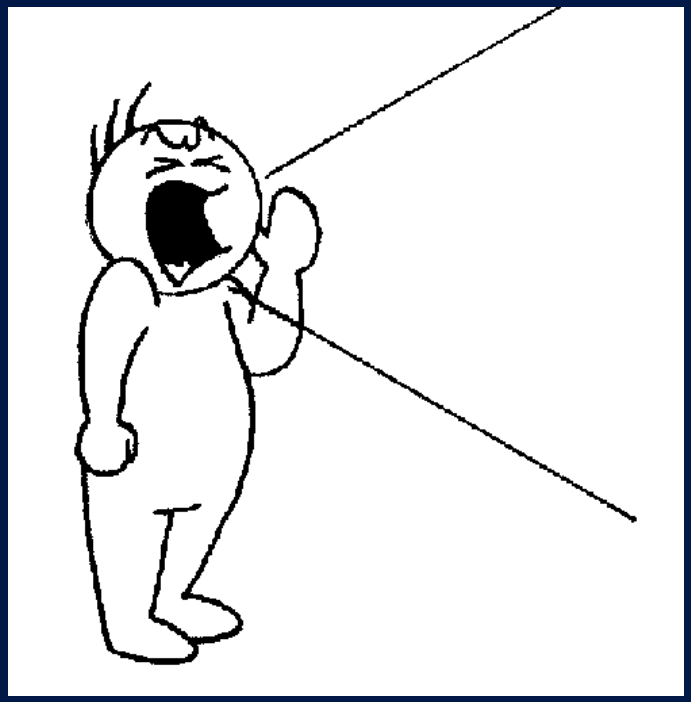


Oil Budget


100%
75%
50%
25%
Mass Balance
0
24
48
72
96
120
Spill Time (hr)
Evaporation
Skimming
Burning
Dispersion
Remaining
Fig. 1 Recovery System Performance
Recovery Efficiency (RE) vs. Wind/Sea Conditions
for 3 Representative Advancing Skimmer Groups
(with Light-to-Medium Weight Crude Oil - "ASTM Code #1)
Recovery Efficiency RE (%)
Skimmer Group A
Oleophilic (drums, disc, brush, belt & rope-mop)
Skimmer Group B
Paddle Belt, Fixed & Moving Submersion Plane
Skimmer Group C
Air Conveyor, Weir, Direct Suction & Vortex
Calm Water
Protected Water
Open Water
Open Water (Rough)
Beaufort Scale
Wind Speed (Kts)
Wave Height (ft)
Spiltec 2009
Fig. 2 Recovery System Performance
Recovery Efficiency (RE) vs. Oil Type/Condition
for 3 Representative Advancing Skimmer Groups
(with Calm Water Conditions)
Recovery Efficiency RE (%)
Skimmer Group A
Oleophilic (drums, disc, brush, belt & rope-mop)
Skimmer Group B
Paddle Belt, Fixed & Moving Submersion Plane
Skimmer Group C
Air Conveyor, Weir, Direct Suction & Vortex
Gasoline
Light Distillates
Diesel & Light Crude
Medium Weight Crudes
Heavy Crudes & Fuel Oils
Very Heavy Fuel Oils & Bunkers
ITOPF Group #
Viscosity (cSt) at 100°F
°API
ASTM Test Oils Code #
Spiltec 2009
Max UT day1
UT day1
fill
transit, off-load, secure
fill
transit, off-load, transit
- credit assigned for volume recovered
Volume Recovered
Spill
Sunrise
ETA
Sunset
Calculation Intervals
Spill Time
Mechanical Recovery

Spills present opportunities for scientific advancement

Contacting your NOAA SSC



- There are only nine NOAA SSCs for all the US and US Territories.

- For support call:

  Desk: 617-223-8016

  Cell. 617-877-2806

  Steve.lehmann@noaa.gov

24hr: (206) 526-4911

or log on to www.response.restoration.noaa.gov